

What is claimed is:

1. An instrument mount apparatus for positioning a surgical instrument comprising a mount body having a base portion moveably coupled at a first articulating joint and a side portion moveably coupled at a second articulating joint, and an actuator operatively connected to said first and second articulating joints, said first and second articulating joints being freely moveable when said actuator is in an unlocked position, wherein said first and second articulating joints are compressed each into a substantially immovable condition when said actuator is placed in a locked position, and wherein said first articulating joint is at an angle relative to said second articulating joint.

2. The instrument mount apparatus of claim 1 wherein said angle is less than about 120 degrees.

3. The instrument mount apparatus of claim 2 wherein said angle is between about 100 degrees and about 45 degrees.

4. The instrument mount apparatus of claim 2 wherein said angle is about 90 degrees.

5. The instrument mount apparatus of claim 1, wherein said actuator comprises a base post assembled through said base portion and said mount body and interconnected at a first end to a cam operatively interfacing a contact surface on said mount body, and a tie pin having a slotted portion which receives said base post, wherein, upon operation of said cam, said base post is drawn toward said cam and said locked position and a ramped portion of said base post drives said tie pin towards said locked position.

6. The instrument mount apparatus of claim 5, wherein said first articulating joint comprises a ball and socket joint and said base post further comprises a flange at a second end opposite said first end, wherein movement of said cam to said locked position draws said flange against said base portion thereby locking said ball and socket joint.

7. The instrument mount apparatus of claim 5, wherein said second articulating joint comprises a rotational joint including a frustoconical member extending from said side portion and a cooperating frustoconical cavity within said mount body.

8. The instrument mount apparatus of claim 7, further including a grip member, said side portion and said grip member positioned to form an opening therebetween for receiving a surgical instrument.

9. The instrument mount apparatus of claim 8, wherein said tie pin is connected, at a first end, to said grip member.

10. The instrument mount apparatus of claim 9, wherein said tie pin comprises a pair of flexible prongs which interconnect at said first end with said grip member.

11. The instrument mount apparatus of claim 10, wherein movement of said tie pin to said locked position draws and locks said grip member against said side portion and also locks said frustoconical member against said frustoconical cavity thereby locking said rotational joint.

12. The instrument mount apparatus of claim 9, wherein said tie pin is releasably connected to a release button at a second end of said tie pin, wherein pressing of said release button extends said tie pin and grip member to allow removal of said grip member to exchange surgical instruments.

13. The instrument mount apparatus of claim 1, wherein said first articulating joint comprises a ball and socket joint.

14. The instrument mount apparatus of claim 13, wherein said ball and socket joint comprises a ball-shaped member extending from said base portion and a cooperating socket formed within said mount body.

15. The instrument mount apparatus of claim 1, wherein said second articulating joint comprises a ball and socket joint.

16. The instrument mount apparatus of claim 1, wherein said second articulating joint comprises a rotational joint.

17. The instrument mount apparatus of claim 16, wherein said rotational joint comprises a frustoconical member extending from said side portion and a cooperating frustoconical cavity within said mount body.

18. The instrument mount apparatus of claim 17, wherein said side portion further includes a grip member, said side portion and said grip member positioned to form an opening therebetween for receiving a surgical instrument.

19. The instrument mount apparatus of claim 18, wherein said base portion is adapted to cooperatively engage a rail member.

20. The instrument mount apparatus of claim 19, wherein said rail has a top portion and a bottom portion, said bottom portion having a narrowed region adjacent said top portion forming first and second tabs on said top portion and said base portion further comprising first and second hooks adapted to engage said first and second tabs.

21. The instrument mount apparatus of claim 19, wherein said rail is fixed to a sternal retractor.

22. The instrument mount apparatus of claim 19, wherein said rail is fixed to a rib retractor.

23. An instrument mount apparatus for positioning and securing a surgical instrument comprising:

a mount body having a base portion moveably coupled at a first articulating joint and a side portion moveably coupled at a second articulating joint;

a post extending through said first articulating joint along a first axis, said post having a first end portion engaging said base portion;

5 a pin extending through said second articulating joint along a second axis, said pin having an end portion engaging said side portion and a threaded portion;

a knob having an internal bore for receiving said at least a portion of said pin, said internal bore having threads adapted to engage said threaded portion of said pin, said knob having a thrust surface associated therewith adapted to engage and move said post as said knob traverses over  
10 said threaded portion of said pin.

24. The apparatus of claim 23, wherein said first axis is at an angle relative to said second axis.

25. The apparatus of claim 24, wherein said angle is less than about 120 to degrees.

26. The apparatus of claim 25, wherein said angle is between about 100 degrees and  
15 about 50 degrees.

27. The apparatus of claim 26, wherein said angle is about 90 degrees.

28. The apparatus of claim 23, wherein said first articulating joint is a ball and socket joint.

29. The apparatus of claim 28, wherein said ball and socket joint comprises a ball-shaped  
20 member extending from said base portion and a cooperating socket formed within said mount body.

30. The apparatus of claim 23, wherein said second articulating joint is a ball and socket joint.

31. The apparatus of claim 23, wherein said second articulating joint is a rotational joint allowing rotation of said side member about said second axis.

25 32. The apparatus of claim 31, wherein said rotational joint comprises a frustoconical member extending from said side portion and a cooperating frustoconical cavity within said mount body.

33. The apparatus of claim 23, wherein said post further comprises a cam surface positioned to mate with said thrust surface, whereby rotation of said knob along said threaded portion causes translation of said thrust surface in a direction along said second axis, said thrust surface  
30 engaging said cam surface to move said post in a direction along said first axis.

34. The apparatus of claim 33, wherein said first articulating joint becomes to locked when said post is urged in a first direction along said first axis and returns to a condition which allows articulation when said post is urged in an opposite direction to said first direction along said first axis.

35. The apparatus of claim 23, wherein said knob comprises a first end adapted to be grasped by a user and a housing end adapted to be received within said mount body, 15 said thrust surface being located on said housing end.

36. The apparatus of claim 23, further comprising a lift member slidable along said  
5 second axis, said lift member having a first end having said thrust surface and a second end, said knob having a first end adapted to be grasped by a user and a housing end adapted to be received with said mount body, said housing end positioned to engage said second end.

37. The apparatus of claim 23, wherein said mount body has a top opening and said post  
10 has a second end constrained within said top opening, said second end being slidable within said top opening along said first axis.

38. The instrument mount apparatus of claim 23, wherein said base portion is adapted to cooperatively engage a rail member associated with a retractor apparatus.

39. The instrument mount apparatus of claim 38, wherein said rail has a top portion and a  
15 bottom portion, said bottom portion having a narrowed region adjacent said top portion forming first and second tabs on said top portion and said base portion further comprising first and second hooks adapted to engage said first and second tabs.

40. An apparatus for stabilizing a localized portion of a beating heart, comprising:  
a substantially rigid base member having at least one contact area adapted to  
frictionally engage the surface of the beating heart adjacent a first side of a target vessel; and  
20 a wire frame coupled to said base member, said wire frame having a frame portion adapted to engage the beating heart adjacent a second side of the target vessel opposite to the first side and at least one leg portion, said leg portion connecting said frame portion to said base member.

41. The apparatus of claim 40, further comprising a delivery stem having a proximal end  
and a distal end, said base member being operably connected to said distal end.

25 42. The apparatus of claim 41, wherein said delivery stem is substantially rigid.

43. The apparatus of claim 42, wherein said delivery stem is curved.

44. The apparatus of claim 40, wherein said leg portion is substantially perpendicular to  
said frame portion.

45. The apparatus of claim 40, wherein said wire frame is moveable relative to said base  
30 member.

46. The apparatus of claim 45, wherein said base member further comprises a channel for  
slidably receiving at least a portion of said leg portion.

47. The apparatus of claim 46, wherein said leg portion has a plurality of detented  
positions within said channel.

48. The apparatus of claim 47, wherein said channel further comprises a plurality of teeth and said leg portion further comprises a plurality of mating teeth adapted to engage said teeth.

49. The apparatus of claim 40, wherein said leg portion is substantially flexible relative to said base member.

5 50. The apparatus of claim 49, wherein said wire frame is formed from a unitary length of wire material.

51. The apparatus of claim 50, wherein said wire material is selected from the group consisting of stainless steel and titanium.

52. The apparatus of claim 40, wherein said frame portion has a first end and a second  
10 end and said wire frame comprises a first leg portion attached to said first end and a second leg portion attached to said second end, said first and second leg portions being coupled to said base member.

53. The apparatus of claim 52, wherein said base portion further comprises a first channel and a second channel for slidably receiving said first leg portion and said second leg portion respectively.

15 54. The apparatus of claim 45, wherein said base member further comprises a pinion gear having a plurality of gear teeth and said leg portion further comprising a rack having a plurality of mating teeth adapted to engage said gear teeth.

55. The apparatus of claim 45, wherein said base member further comprises a threaded shaft rotatably coupled to said base member, and said leg portion further comprises a collar having a  
20 threaded interior adapted to receive said threaded shaft.

56. The apparatus of claim 40, wherein said frame portion is vertically offset from said at least one contact area.

57. The apparatus of claim 56, wherein said vertical offset is between about 0.05 inches to about 0.2 inches.

25 58. The apparatus of claim 56, wherein said at least one contact area is substantially planar.

59. The apparatus of claim 40, wherein said at least one leg portion further comprises a vertically relieved portion.

60. An apparatus for stabilizing a localized portion of a beating heart comprising:  
30 a substantially rigid base member formed from a unitary piece of sheet material having a first side and a second side, said base member having a first section adapted to contact the surface of the beating heart and a second section at a fixed angle to said first section, said first section defining a first contact surface, a second contact surface, and an open space therebetween; and  
a ball-shaped member connected to said second section at a location which is offset  
35 from said open space.

61. The apparatus of claim 60, further comprising a post having a first end and a second end, said first end attached to said second section at said location and said second end attached to said ball-shaped member.

62. The apparatus of claim 60, further including a delivery stem having a proximal end and a distal end having a socket operably engaged with said ball-shaped member.

63. The apparatus of claim 62, wherein said delivery stem is curved.

64. The apparatus of claim 62, wherein said delivery stem is a shaft.

65. The apparatus of claim 60, wherein said angle is from about 75 degrees to about 105 degrees.

66. The apparatus of claim 65, wherein said angle is about 90 degrees.

67. The apparatus of claim 66, wherein said post extends from said first side.

68. The apparatus of claim 60, wherein said angle is more than about 120 degrees and said post extends from said second side.

69. An apparatus for stabilizing a localized portion of a beating heart, comprising:  
a substantially rigid base member having at least one surface adapted to contact the surface of the heart, a post having a first end moveably coupled to said base member and a second end having a ball-shaped member extending therefrom.

70. The apparatus of claim 69, further comprising a delivery stem having a proximal end and a distal end, said distal end having a socket operably engaged with said ball-shaped member.

71. The apparatus of claim 69, wherein said delivery stem is substantially rigid.

72. The apparatus of claim 69, wherein said base member has a first section having at least one surface for contacting the surface of a heart and a second section adjacent said first section, said post being moveably coupled to said second section.

73. The apparatus of claim 72, wherein said second section is at an angle relative to said first section.

74. The apparatus of claim 72, wherein said second section has a slot adapted to receive said first end of said post, said first end being moveable within said slot from a first position to a second position.

75. The apparatus of claim 69, wherein at least a portion of said base member has a curved outer profile and said post is mounted to a top member having an interior profile adapted to engage and concentrically rotate about said curved outer profile.

76. The apparatus of claim 75, wherein said base member has at least one elongate slot and said top member has at least one tab engaged within said at least one slot.

77. An apparatus for stabilizing a localized portion of a beating heart, comprising:

a base member having at least one surface adapted to contact the surface of the heart,  
a link member pivotably coupled to said base member at a predetermined pivot point, said link member  
having a first link end spaced a distance away from said pivot point; and

5 a post having a first post end attached to said first link end and a second post end  
having at least a ball shaped member extending therefrom.

78. The apparatus of claim 77, further comprising a delivery stem having a proximal end  
and a distal end, said distal end having a socket operably engaged with said ball shaped member.

79. The apparatus of claim 78, wherein said delivery stem is substantially rigid.

80. The apparatus of claim 77, wherein said link member has a second link end opposite  
10 said first link end, said second link end being releasably locked to said base member to substantially  
prevent relative movement of said link member relative to said base member.

81. The apparatus of claim 77, wherein said link member pivots about a pivot pin  
extending from said base member.

82. The apparatus of claim 81, wherein said base member has a first contact surface, a  
15 second contact surface, and an open space therebetween.

83. The apparatus of claim 82, wherein said link member has a first position wherein said  
post is offset from said open space in a first direction and a second position wherein said post is offset  
from said open space in a second direction.